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**Notice of Allowability**

Application No.

10/736,023

Examiner

Thomas R. Artman

Applicant(s)

KAMATH ET AL.

Art Unit

2882

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 15 April 2003.
2. ☒ The allowed claim(s) is/are 1-12.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☐ All    b) ☐ Some\*    c) ☐ None    of the:
    1. ☐ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
  - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
    - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
  - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

- |   |  |
|---|--|
| 1. <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 5. <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)            |
| 2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 6. <input type="checkbox"/> Interview Summary (PTO-413),<br>Paper No./Mail Date _____. |
| 3. <input checked="" type="checkbox"/> Information Disclosure Statements (PTO-1449 or PTO/SB/08),<br>Paper No./Mail Date <u>15 March 2004</u> | 7. <input type="checkbox"/> Examiner's Amendment/Comment                               |
| 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit<br>of Biological Material                                    | 8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance   |
|   | 9. <input type="checkbox"/> Other _____.   |

## **DETAILED ACTION**

### ***Information Disclosure Statement***

The information disclosure statement (IDS) submitted on March 15<sup>th</sup>, 2006, is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner. Please see the attached PTO-1449, initialed and signed by the examiner.

### ***Drawings***

The drawings filed April 9<sup>th</sup>, 2004, are accepted by the examiner.

### ***Allowable Subject Matter***

Claims 1-12 are allowed.

The following is an examiner's statement of reasons for allowance:

The prior art of record neither teaches nor reasonably suggests an apparatus or method of use including:

a) a fluence map of a desired intensity profile being converted to a preliminary leaf sequence that minimizes machine on-time and is generated without any leaf movement constraints,

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b) imposing at least one leaf movement constraint on the preliminary leaf sequence and apply a constraint elimination algorithm that adjusts the preliminary leaf sequence in order to minimize violations of the leaf movement constraint, such that

c) the fluence map and the minimized machine on-time are provided as required by the combinations as claimed in each of claims 1 and 8.

The best prior art of record, Siochi (US 6,661,871 B2), teaches the practice of simultaneously minimizing the number of segments (which minimizes machine on-time) and applying a leaf movement constraint and corresponding constraint elimination algorithm (reducing tongue-and-groove effects), rather than minimizing machine on-time and imposing leaf movement constraints in separate steps. Langer et al. (Med.Phys., 28:2450-2458, 2001) teaches the practice of minimizing the number of segments or the number of monitor units (both result in minimized machine on-time) separately from the imposition of leaf movement constraints; however, the machine on-time is increased after the imposition of the constraints, either through an increased number of segments or monitor units.

Claims 2-6 and 9-12 are allowed by virtue of their dependency.

The prior art of record neither teaches nor reasonably suggests a method of reducing tongue-and-groove under dose, including:

a) converting a fluence map of a desired intensity profile to a preliminary leaf sequence that minimizes machine on-time without applying any leaf movement constraints,

b) modifying at least one leaf pair of the preliminary leaf sequence to form a modified leaf sequence by identifying and adjusting the positions of the leaves that violate a tongue-and-groove constraint,

c) modifying at least one pair in the modified leaf sequence to produce a further modified leaf sequence, where the further modified leaf sequence provides the intensity profile,

d) examining the further modified leaf sequence for violations of the tongue-and-groove constraint, and

e) iteratively repeating steps b-d if tongue-and-groove violations are identified using the further modified leaf sequence as the preliminary leaf sequence, in the combination as claimed in claim 7.

The best prior art of record, Siochi, teaches the practice of applying a tongue-and-groove constraint in a similar manner as that of claim 7; however, the preliminary leaf sequence is simultaneously minimized for machine on-time (reducing the number of segments), rather than performing the functions separately. Langer et al. teaches the sequential preliminary leaf sequence generation for minimized on-time, followed by applying a tongue-and-groove constraint; however, the constraint is applied to only one pair of leaves per iteration, as opposed to the claimed method of modifying two pairs of leaves per iteration.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

### *Conclusion*


The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Steinberg (US 6,795,523 B2) teaches the practice of reducing the number of segments by applying leaf movement constraints. Grosser (US 6,477,229 B1) teaches segment reduction methods without leaf movement constraints. Chang (US 6,853,705 B2) teaches a residual approach to reducing the number of segments and also applies collimator angle constraints. Siochi (US 6,330,300 B1) teaches the reduction of segments through applying movement constraints. Convery (WO 99/48558) teaches the simultaneous optimization of segments using a variety of leaf movement constraints for either dynamic or static IMRT fields.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thomas R. Artman whose telephone number is (571) 272-2485. The examiner can normally be reached on 9am - 5:30pm Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ed Glick can be reached on (571) 272-2490. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Thomas R. Artman  
Patent Examiner



EDWARD J. GLICK  
SUPERVISORY PATENT EXAMINER